

spots are subapical, two spots being close together below the fifth subcostal nervule, the second between the first radial, while the third is a little further off near the hind margin, below the second radial nervule.

Hind wing black, enclosing a large yellow area which reaches from near the base of the wing, spreads over the cell, and occupies the basal third of the disk.

Underside. Fore wing dusky, the apex somewhat reddish; the base buff chestnut, extending along the basal edge of the costal margin. The white spots of the upper surface indicated by pearly-white spots below.

Hind wing. Bright chestnut at the base, with tiny dots of black, followed by a yellow mesial area, almost coextensive with the same area on the upper surface, but reaching to the inner margin of the wing behind the chestnut, which has sharply quadrate borders on its hinder aspect; the whole of the hind margin bronzy brown with a reddish tinge, forming a very broad band, the nervules marked by black lines, with a mesial line of black between each nervule to the hind margin.

Exp. $2\frac{1}{4}$ inches.

Hab. Mount Elgon, Feb. 1890.

DESCRIPTION OF THE PLATES.

PLATE XVI.

- Fig. 1. *Papilio mackinnoni*, sp. n., p. 187.
 2. *Mylothris wintoniana*, sp. n., p. 189.
 3. *Mylothris jacksoni*, sp. n., p. 190.
 4. *Belenois margaritacea*, sp. n., p. 191.
 5. *Mylothris mackenziana*, sp. n., p. 190.
 6. *Teracolus elgonensis*, sp. n., p. 191.

PLATE XVII.

- Fig. 1. *Papilio jacksoni*, sp. n., ♂, p. 188.
 2. *Papilio jacksoni*, sp. n., ♀, p. 188.
 3. *Acræa excelsior*, sp. n., p. 192.
 4. *Acræa melanoxantha*, sp. n., p. 193.
 5. *Acræa oreas*, sp. n., p. 193.

3. On the Comparative Osteology of the United States *Columbidæ.* By R. W. SHUFELDT, C.M.Z.S.

[Received February 2, 1891.]

Opportunity has recently been afforded me to compare together examples of the skeletons of the following species of Pigeons of our avifauna, viz.:—*Ectopistes migratorius*, *Zenaidura macroura*, *Engyptila albifrons*, *Melopelia leucoptera*, *Columbigallina passerina*, *Scardofella inca*, and *Starnænas cyanocephala*. I have also had at hand during this work skeletons of several of our domesticated varieties, a large series of skeletons of nearly all our gallinaceous birds, and the published accounts of the osteology of many forms of columbine

types, such as have been described by the Newtons, by the Parkers, by Fürbringer, and by many others¹.

So far as I have examined them, then, I find the Pigeons of this country to be:—

1. Completely schizognathous birds; and with elongated narial apertures in the skull, which are not separated by an osseous septum nasi.
2. A large lacrymal bone is present, which fuses extensively with the *pars plana*, thus forming an unbroken plate.
3. With large vacuities in the anterior wall of the brain-case, the lower one of which merges with a big one in the interorbital septum.
4. Zygoma very slender.
5. Basipterygoid processes present, which may (in all save *Ectopistes*?) or may not articulate with the short pterygoids; the latter not in contact in the middle line anteriorly.
6. Palatines very slender, with their laminæ somewhat reduced, and with their postero-external angles completely rounded off.
7. Maxillo-palatines antero-posteriorly elongated, internally spongy, and fused with the prepalatines, the maxillary, and the premaxillary.
8. The premaxillary process of the nasal bone carried far forwards, beneath the osseous culmen.
9. Sphenoidal rostrum sharp in front, thick and rounded behind.
10. Vomer may or may not be present (?). Huxley figures the palate of *Columba palumbus*, and says "the vomer is very slender" (P. Z. S. 1867, p. 434); Parker says the Pigeons are without a vomer.
11. Quadrates typically ornithic, and with two transversely disposed facettes for articulation with mandible.
12. Mandible V-shaped, its symphysis short and feeble; articulatory ends transversely truncated posteriorly, from above, downwards and forwards; ramal vacuity may (*Ectopistes*) or may not (*Starnænas*) be present.
13. Eighteen (*Ectopistes*) or nineteen (*Starnænas*) vertebræ in the spinal column between the skull and pelvis. Three leading dorsal vertebræ fuse together to form one bone (*Ectopistes*), and with it may fuse the ultimate cervical (*Melopelia*). Five (*Starnænas*) or six (*Ectopistes*) free caudal vertebræ. A good-sized pygostyle present. Pelvis broad and shallow; no prepubic spine present.
14. Os furcula U-shaped; without hypocleidium, and very slender.

¹ To the U.S. National Museum, and to Mr. F. A. Lucas of that Institution, I am indebted for the use of a skeleton of *Ectopistes* and one of *Columbigallina passerina*; one of the assistants also, Mr. Schollick, has presented me with a skeleton of the domesticated Pigeon known by the name of the "Archangel." Mr. J. S. Singley of Giddings, Texas, has likewise forwarded me several valuable specimens. My private cabinet also contains numerous skeletons of our various species of *Columbidæ*.

15. Sternum large, with very deep carina; two pairs of flaring xiphoidal processes, usually making the bone 4-notched, but the posterior or more inconspicuous internal pair of xiphoidal processes may unite by their extremities with the mid-xiphoidal prolongation and thus create fenestræ behind. Manubrium small. Corpnis sterni often narrow for its entire length. Usually four articular facettes upon each costal border.
16. The *humerus* is straight, pneumatic, and its radial crest is triangular in form. The *radius* is straight and the *ulna* is bowed.
17. Trochanter of *femur* elevated above the summit of the shaft. *Patella* may be very small and in two pieces, or it may be larger with a single minute piece near it (*Starnœnas*). Ossific centres in tibial cartilage.
18. Hypotarsus of *tarso-metatarsus* of short cubical form, and is both pierced and grooved for the passage of tendons. *Hallux* on a level with the other toes, and its metatarsal peculiarly twisted. Phalanges of pes 2, 3, 4, 5 for the 1st to 4th toes respectively.

CONCLUSIONS.

Our Suborder of *Columbæ* in the United States contains but one family—the *Columbidæ*. Whether the Quail-Doves of the genus *Starnœnas* should be awarded a subfamily of the *Columbidæ* can only be settled when we are in possession of a full knowledge of their anatomy. So far as the osteology of *Starnœnas cyanocephala* goes, it would seem to indicate that a subfamily line separates it from our other Pigeons¹.

One of the best established facts in ornithology is that the *Columbidæ* are nearly related to the great gallinaceous group of birds, so then the nearest relatives they have in our avifauna are the *Tetraonidæ*, especially the Grouse. Then beyond them are the *Cracidæ* and Turkeys. Huxley has said (P. Z. S. 1867, p. 460) that "on the other side they seem to be allied with the Owls and Vultures." Such affinities, however, must be quite remote. There is no question about the links that connect the Columbine types with the Grouse and Ptarmigans (*Lagopus*), for they are most perfectly seen in the Sand-Grouse, holding as these latter do a morphological position directly between them. The Plovers are not so far off in another direction, and *Tinamus* and *Hemipodius* have also distant claims to kinship. The extinct Dodo and the existing *Didunculus* of Samoa show other and perhaps nearer relations. Fossil remains of Pigeons, so far as the present writer is aware, have not as yet been found in this country, though those of several species of Turkeys have.

¹ With its enormous sternum, its differently constituted vertebral column, and a number of other points, it will at once be seen that, osteologically, *Starnœnas* is quite different from any of our other Pigeons. These characters are also supported by others already pointed out by Coues (Key, 2nd ed. p. 571), who has created for it the subfamily *Starnœnadinæ*, and I am strongly inclined to believe he is right.